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(56) Documents Cited

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INT CL⁷ B60S 1/40 1/42

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(54) Abstract Title

Windscreen wiper/blade arm connector

(57) A connector for pivotally joining a wiper blade assembly to the wiper arm, consists of a body member 110 and a securing member 130, attached by snap fit pivot 130 and 123. Body 110 has a cylindrical channel 121 to accommodate a pivot (not shown) from the wiper blade assembly. In use wiper arm 101 is retained on the body between guide rails 124 and curved portion 126 on the body member and clamped in position by closing the securing member 130. Projection 132 of the securing member thus engages with recess 104 of the wiper arm, to positively retain the arm. In an alternative embodiment projection 132 passes right through the hook and engages with a recess in the body member.

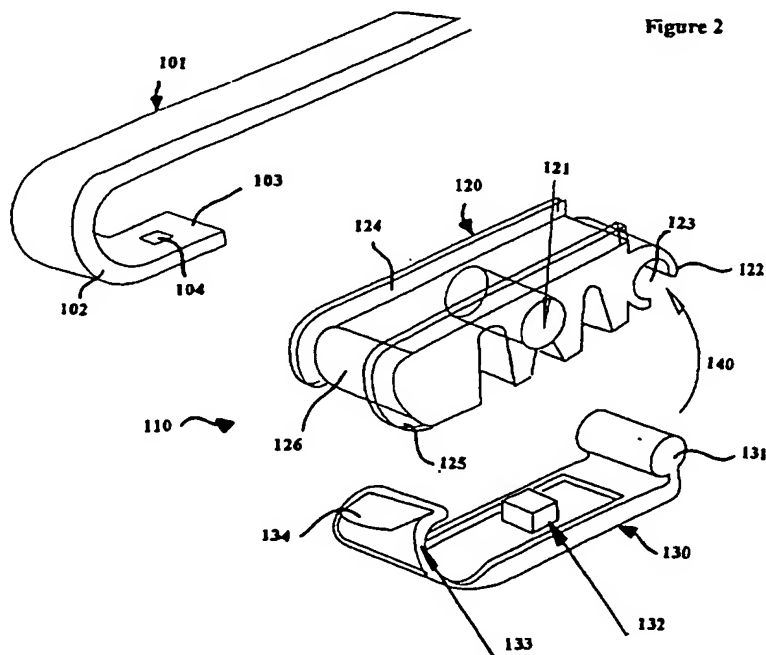
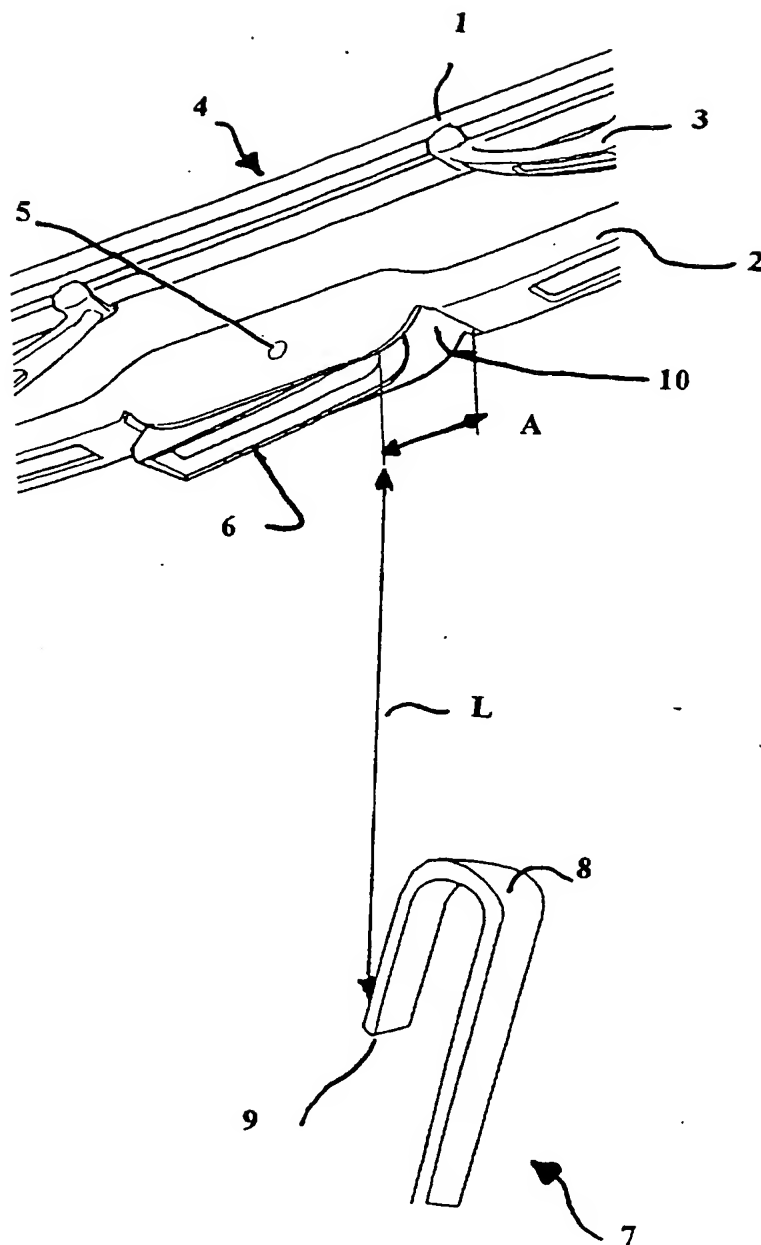


Figure 2

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Figure 1



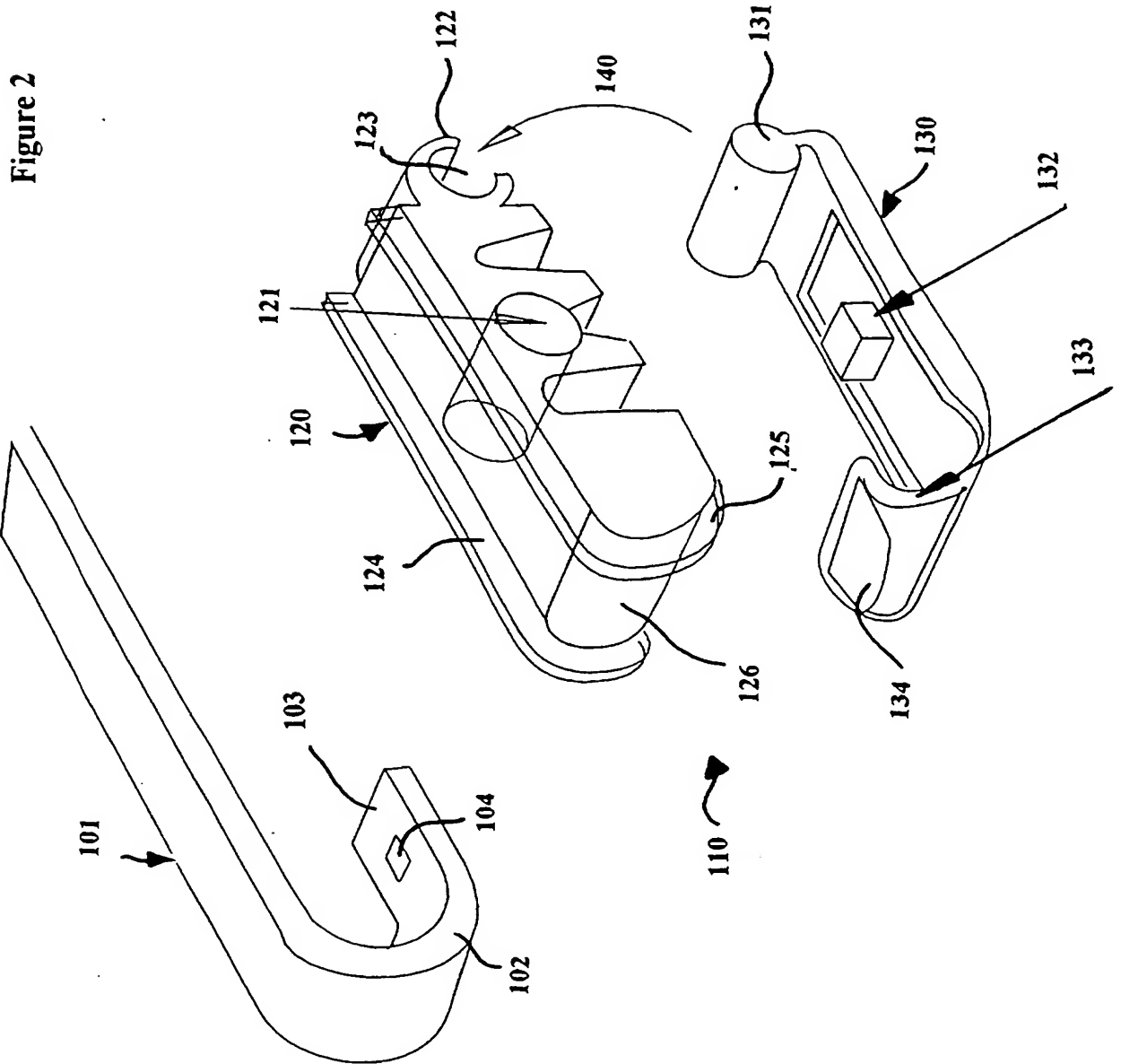


Figure 3

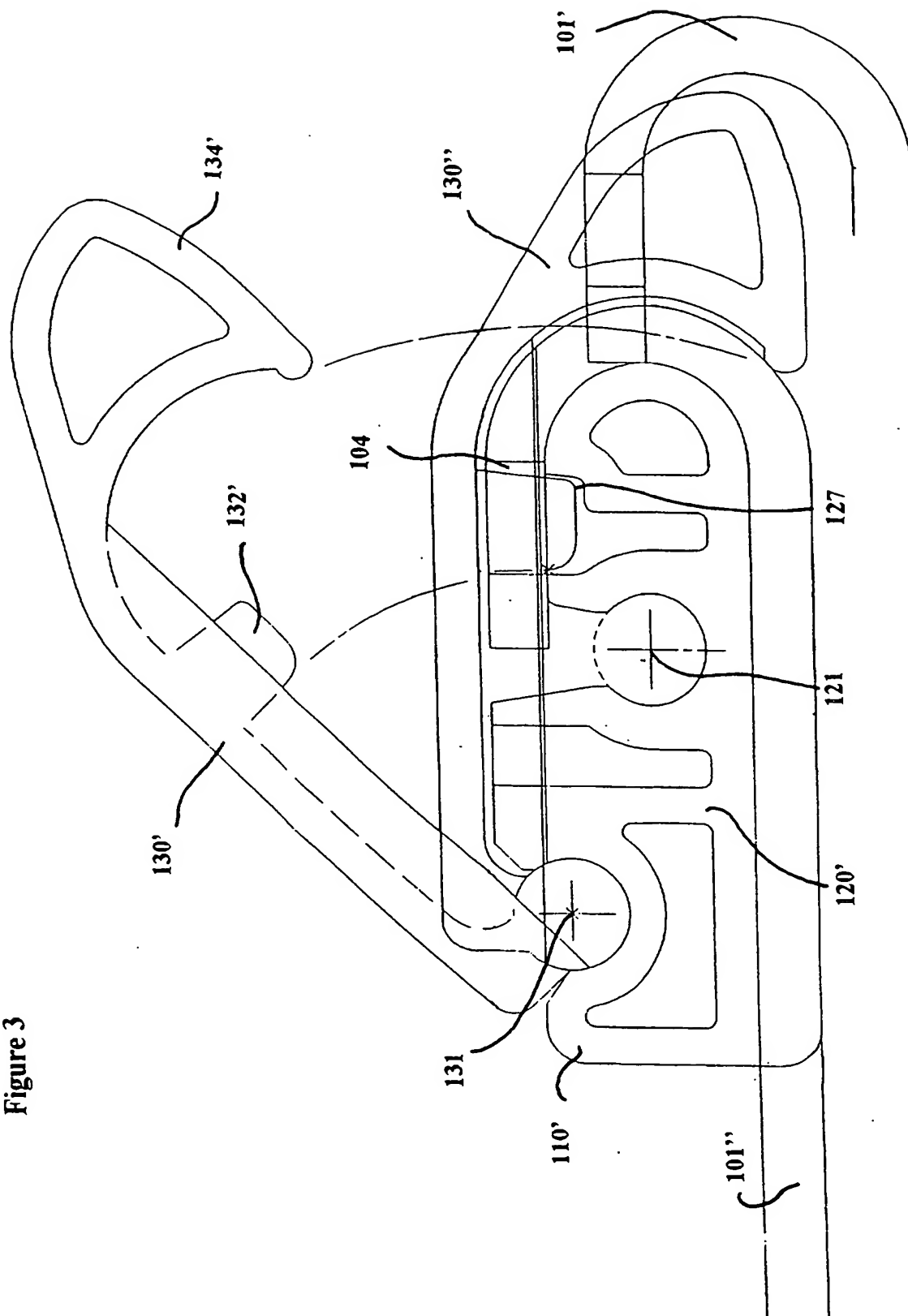


Figure 4

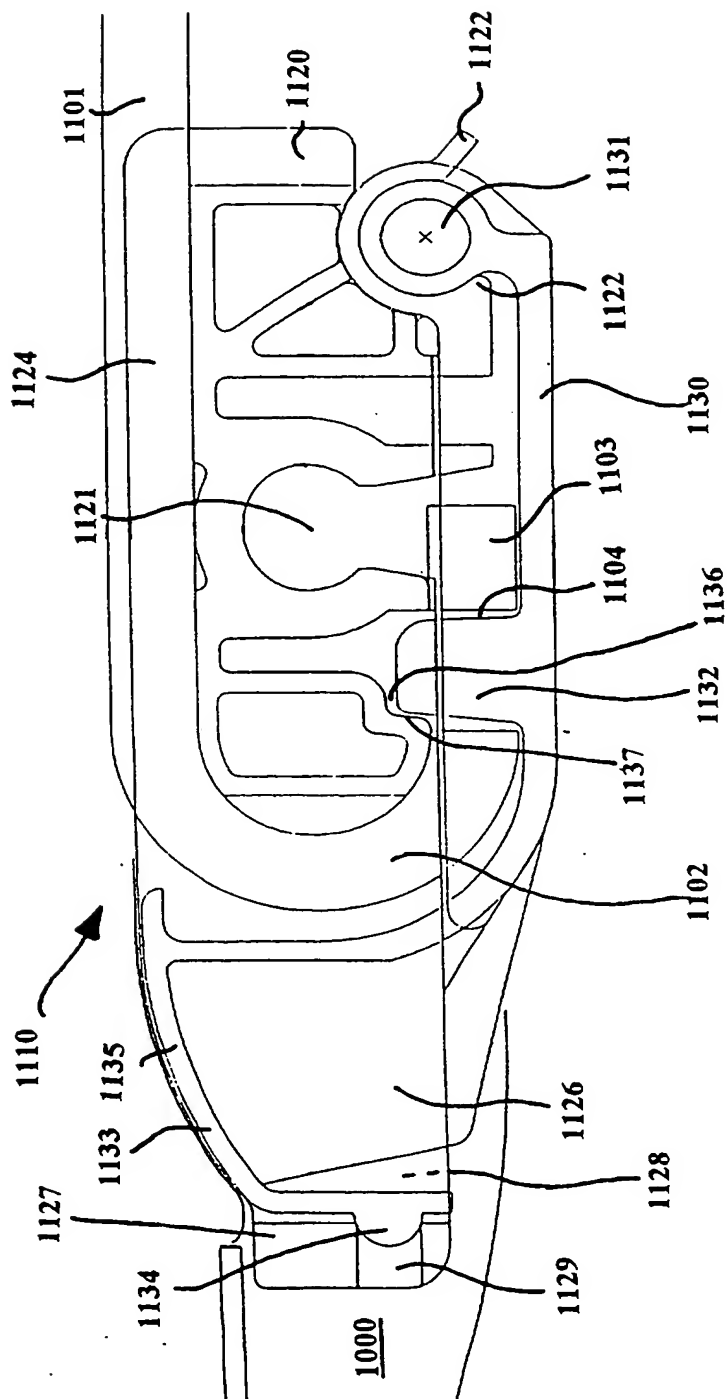


Figure 5

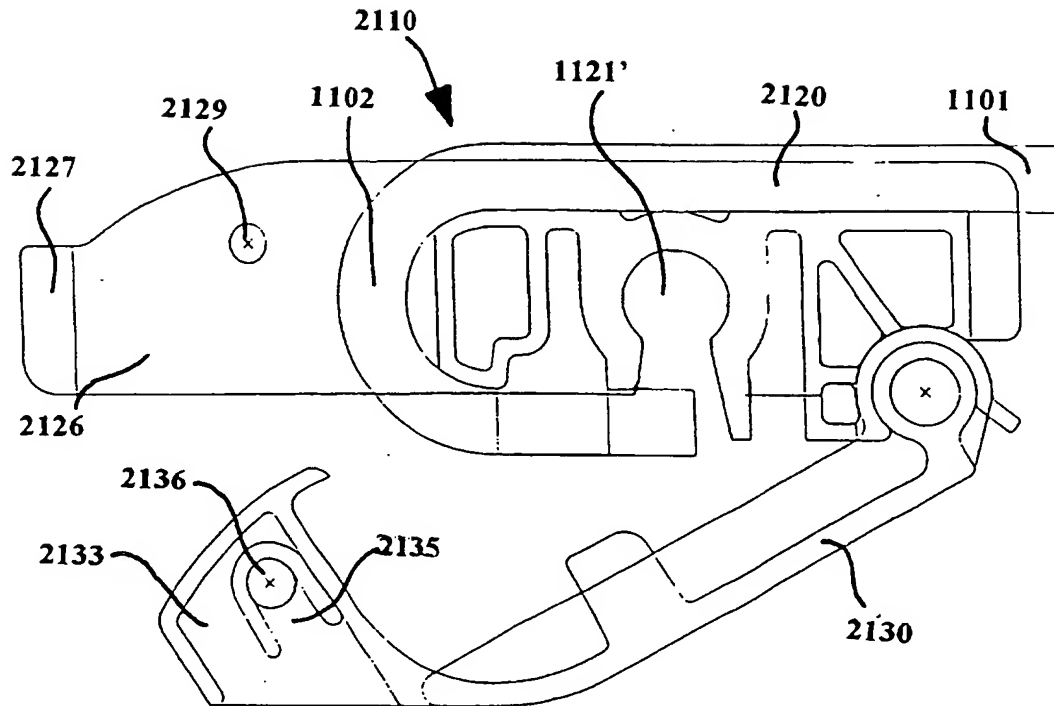
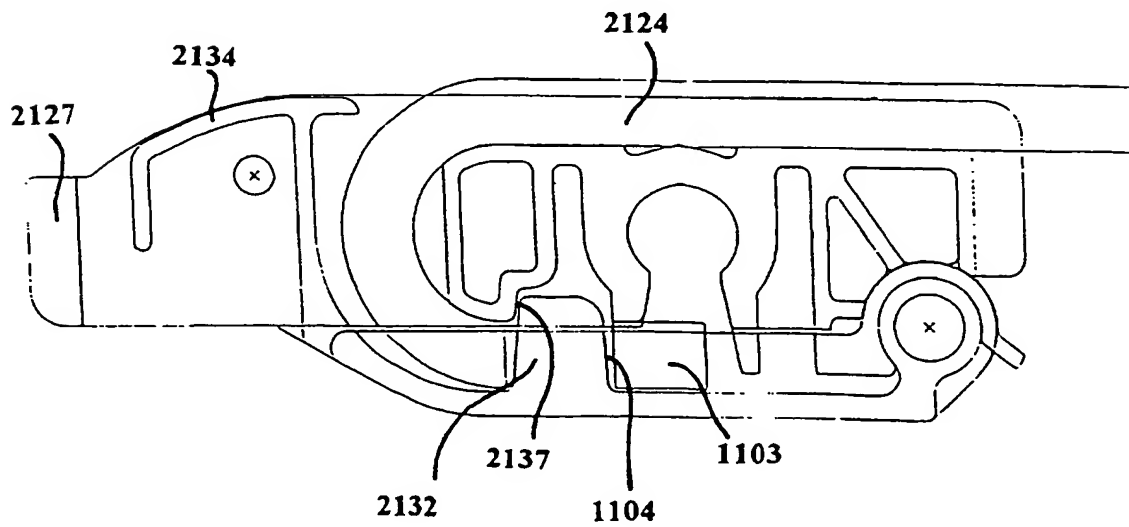


Figure 6



WINDSCREEN WIPER BLADE/ARM CONNECTORDESCRIPTION

5 This invention relates to a connector and more specifically to a connector for connecting a windscreen wiper blade to a windscreen wiper arm in vehicles such as automobiles, whilst also being related to a windscreen wiper assembly.

10 In a conventional windscreen wiper assembly, the windscreen wiper blade, comprising a rubber squeegee and support, is attached to a windscreen wiper arm by virtue of a clip around which a hook portion of the end of the arm is secured. The clip is pivotally connected to a portion of the support called a bridge, allowing for limited rotation of the blade. The clip is situated
15 in a slot of the support and this slot further defines an aperture through which the hooked end of the arm extends. In order to replace a conventional windscreen wiper blade the arm, which is securely attached to the pivot shaft of the assembly, is rotated away from the windscreen and the hook portion is disengaged from the clip by forcing the clip and hook apart. The blade is then
20 rotated so that it lies in an almost perpendicular direction to the arm and the hook portion is pulled through the aperture of the blade.

 The hook is then placed through the aperture of a new blade at an acute angle. The clip and blade are rotated so as to lie substantially parallel to the
25 arm. The hook portion is encouraged to engage the clip by forcing the clip between the parallel legs of the hook. The distal leg of the hook has to be relatively long so that the hook can be securely located on the clip and this requires that the space between the support and the squeegee is such that the hook can be accommodated. This operation requires both physical strength
30 and a high degree of manual dexterity. The action of forcing the clip into the hook can also cause a strain in the legs thereof and can cause the arm to bend. Furthermore the size of the aperture can have a detrimental effect on the

strength of the blade. The thickness of the material of the blade has to be increased in order to compensate for the size of the aperture.

In order that the above-identified problems are addressed a number of possible solutions have been propounded. Daimler Benz (GB-B-2167654) suggested that the hook portion could be shortened and the clip could comprise a pivotally connected securing member which holds the hook in place. The hook and blade are mutually assembled by aligning the blade substantially parallel to the arm and pushing the hook through the aperture. The aperture is so sized that it can accommodate the hook when not engaged with the clip. The arc portion of the hook is then moved towards the pivot of the clip and the securing member is pivoted into alignment with the blade. As it pivots it forces the hook further toward the blade pivot until the securing member snaps over the hook. In so doing the blade is resiliently attached to the arm.

Lee (US-5632059) provides a connector unit which allows for a variety of different types of wiper arm to be connected to a blade, such as pin type, bayonet type and hook type. The pivotally attached connector is provided with seats. Once the hook has been secured in place by the connector the seats abut the hook to clamp the hook in place.

The two above-identified prior art connectors both suffer from a number of problems. In operation the forces exerted on the wiper blade are extreme. The point of attachment of the blade to the arm is therefore subjected to the full extent of these forces. Thus, in case of a fault in the arm material and subsequent weakening, or indeed fracture thereof, the blade needs to be securely held. Furthermore, a blade may need to be replaced a number of times during the lifetime of a car and therefore the connector must be able to resist repeated operation for the replacement of blades.

It is therefore an object of the present invention to provide a connector for a windscreen wiper assembly which allows for ease of replacement and securely attaches a blade to a wiper arm. Furthermore, it is also an object of the invention to provide a connector and a windscreen wiper assembly
5 incorporating an inventive connector in which the aperture can be kept as small as possible to increase the strength of the bridge for a given bridge depth and material thickness.

According to a first aspect of the invention there is provided a
10 connector for a windscreen wiper assembly, comprising a body with a pivot point about which it is pivotally connectable to a windscreen wiper blade and a securing element attached pivotably to the body for pivotal movement between an open position and a closed position, wherein the securing element further comprises restraining means arranged to engage the end of the hook of
15 the wiper arm, in use.

The connector body may be slideable between the legs or side members of the hook of the wiper arm.

20 The connector may further comprise biasing means which, in use, in the closed position, biases a hook at an end of a wiper arm towards the body.

Preferably, the restraining means of the securing element may be engageable with an aperture of the hook and may, in use, in the closed
25 position, protrude through the aperture, preferably into a mating cavity of the connector body.

The securing element can be attached to the connector body in a snap-fit fashion or, alternatively, via an integral hinge portion. The snap-fit
30 connection may be provided by a transverse projection of, for example, substantially circular section on the securing element and transverse

restraining arms on the body which define a mating cavity of, say, substantially circular section.

It has now been found that, in a further embodiment of inventive
5 connector, the securing element may be provided with a substantially
perpendicular extension attached to a distal end thereof, such that, in use, in
the closed position, the extension does not contact the hook of the wiper arm
and is preferably accommodated within the confines of an aperture in the
connector body.

10

Additionally, the securing element and connector body may comprise
a plurality of mutually mating projections and recesses which, in the closed
position, may mate in a snap-fit fashion. A pair of transverse projections may
be provided on the outside of longitudinal sides of the extension which, in the
15 closed position, mate with transverse recesses provided on inner longitudinal
sides of the aperture of the connector body.

Alternatively or additionally, a longitudinal projection may be
provided at a distal end of the extension which may mate, in the closed
20 position, with a recess provided in the inner distal end of the aperture in the
connector body.

Additionally, the biasing means may externally, and clampingly,
engage, in use, the hook at the end of the wiper arm and it may further be
25 provided with a disengagement portion which provides a lever point to help
with the manual forcing of the securing element towards its open position.

The body may be provided with longitudinal side rails which provide,
in use, lateral support for edges of the wiper arm and the body may be
30 constructed from a plastics material.

According to a second aspect of the invention there is provided a windscreen wiper assembly comprising a wiper arm, a wiper blade and a connector, the wiper arm being connectable to a drive unit, such as a pivot shaft, and having a hook at its distal end, the connector comprising a body with a pivot point about which it is pivotally connected to the wiper blade, and a pivotally attached securing element pivotable between an open position and a closed position, wherein the securing element further comprises restraining means engaged cooperatively with the hook of the distal wiper arm end.

10 The connector body may be slideable between legs, or side members, of the hook.

 The assembly may further comprise means which, in the closed position of the element, biases the wiper arm hook towards the connector body

15 Preferably, the restraining means may engage with an aperture of the hook and may, in the closed position, protrude through the aperture, preferably into a mating cavity of the body.

20 The securing element can be attached to the connector body in a snap-fit fashion or, alternatively, via an integral hinge portion. The snap-fit connection may be provided by a transverse projection of, for example, substantially circular section on the securing element and transverse restraining arms on the body which define a mating cavity of, say, substantially circular section.

 Additionally, the biasing means may externally, and clampingly, engage the hook and it may further be provided with a disengagement portion which provides a lever point to help with the manual forcing of the securing element towards its open position.

Preferably, and in the further embodiment of inventive assembly, the securing element may be provided with a substantially perpendicular extension attached to a distal end thereof, such that, in the closed position, the extension does not contact the hook of the wiper arm and is preferably
5 accommodated within the confines of an aperture in the connector body.

Additionally, the securing element and connector body may comprise a plurality of mutually mating projections and recesses which, in the closed position, may mate in a snap-fit fashion. A pair of transverse projections may
10 be provided on the outside of longitudinal sides of the extension which, in the closed position, mate with transverse recesses provided on inner longitudinal sides of the aperture of the connector body.

Alternatively or additionally, a longitudinal projection may be
15 provided at a distal end of the extension which, in the closed position, may mate with a recess provided in the inner distal end of the aperture in the connector body.

The body may be provided with longitudinal side rails which provide
20 lateral support for edges of the arm and the body may be constructed from a plastics material.

In order that the invention may be more fully understood, preferred embodiments of connector, and wiper assembly, in accordance therewith will
25 now be described by way of example and with reference to the accompanying drawings in which:

Figure 1 shows the components of a portion of a prior art windscreen wiper assembly.

Figure 2 shows the components of an inventive windscreen wiper assembly prior to assembly; and

Figure 3 shows the components of a further embodiment of the inventive assembly in both open and closed positions.

Figure 4 is a side elevation of a third embodiment of part of the inventive windscreen wiper assembly;

Figure 5 is a side elevation of a fourth embodiment of part of a windscreen wiper assembly with the securing element in an open position; and

Figure 6 is a side elevation of the fourth embodiment with the securing element in a closed position.

Referring first to Figure 1, there are shown the components of a conventional windscreen wiper assembly. A squeegee 1 is attached to the support 2 via struts 3. These components form the wiper blade 4 to which is pivotally connected, about pivotal axis 5, a connector 6. There is also shown a windscreen wiper arm 7 which has a U-shaped hook portion 8 provided at its free end, its other end being operatively connected to the drive unit of the vehicle (not shown). The hook portion 8 has a relatively long attachment leg 9.

In order to attach the wiper blade 4 to the wiper arm 7, the arm 7 has to protrude through the aperture 10, which has a length A to correspond to the external distance between the legs of the hook. The blade is brought into proximity with the arm along line-of-attack L until the hook 8 protrudes through the aperture 10. The connector 6 is then rotated about its axis of rotation 5 and is then forced towards the apex of the hook 8.

In order that the arm 7 and blade 4 are securely connected, a great deal of force has to be exerted to encourage them into a mating relationship. As previously stated, this is both difficult to achieve due to the restrictive hold that is afforded to a fitter and due to the force required, and it may also result
5 in damage being caused to one or more of the components.

Referring now to Figure 2, there is shown the components of a windscreen wiper assembly. The arm 101 is provided, at its end, with a U-shaped hook portion 102. The relatively short leg 103 of the hook 101 is
10 provided with an aperture 104. The connector 110 comprises a body portion 120 and a securing element 130.

The body portion 120 has a pivot point 121 about which it is connected to the blade of the assembly (not shown) and arms 122 which define a cavity
15 123 of substantially circular cross-section. The body portion 120 is further provided with longitudinal side rails 124, 125 and with a curved end section 126.

The securing element 130 is provided with a transverse portion 131 of
20 substantially circular cross-section, a spigot 132, a curved upstanding portion 133 and a tab 134.

In order to assemble the windscreen wiper assembly the body is pivotally connected to a wiper blade by a rivet or other manner known in the
25 art. The transverse portion 131 of the securing element is then secured in the cavity 123, in a snap-fit fashion, and held by the transverse arms 122. The securing element 130 thereby being pivotally connected to the connector body 120. When the longitudinal axes of the securing element 130 and connector
30 body 120 are not parallel the element 130 is considered to lie in an open position.

The hook 101 is then placed alongside the connector 110 so that the longitudinal axes of connector 110 and hook 101 are parallel. The curved portion 126 of the connector body 120 is then slid into the U portion of the hook so that the legs of the hook 101 straddle the connector body 120. The
5 securing element 130 is then rotated about its pivot so that the upstanding curved portion 133 engages the outer surface of the hook and thereby biases the hook 101 towards the connector body 120. The curved portion 133 clamping the hook 101 to the connector body 120 and the spigot 132 engaging the aperture 104 of the hook 101. The securing element 130 is thereby
10 considered to be in its closed position. The side rails 124, 125 act to transversely contain the hook 101 and to provide lateral support therefor.

The curved portion 133 and spigot 132 of the securing element 130 act to bias the hook 101 towards the body 120 and restrain it there respectively. If
15 one element should fail in the longitudinal axis of the assembly the other is provided to maintain the connection.

In order to disassemble the assembly, the disengagement tab 134 is pushed to force the securing element into its open position. The tab 134 may
20 be pushed through the aperture of the blade through which the hook 101 was inserted.

Referring now to Figure 3, there is shown a further embodiment of windscreen wiper assembly with similar elements to those of Figure 2 given
25 identical numerals. The Figure shows the securing element 130 in both open 130' and closed 130'' positions with the hook 101 in positions disengaged from 101', and secured to 101'', the connector 110 respectively.

The connector body 120' is pivotally attached to the securing element
30 130 by virtue of a snap-fit arrangement between transverse portion 131 of the element 130 and cavity 123' of the connector body.

The securing element 130 is again provided with a spigot 132' and an upstanding portion 133 which restrain and bias the hook 101 respectively as previously described. However the spigot 132', in this embodiment, protrudes
5 through the aperture 104 and engages with a cavity 127 of the connector body 120'. Furthermore the disengagement portion 134' is formed as a portion of substantially triangular cross section to provide it with a greater structural rigidity.

10 In assembly and disassembly of the windscreen wiper assembly, the embodiment of Figure 3 is identical to that of Figure 2 with the exception of the protrusion of the restraining means 132' into a formed cavity 127 to thereby more securely restrain the hook 101.

15 The connector body 110 described above may be constructed from a variety of materials such as plastics, aluminium or a variety of light-weight alloys. The two components of the connector may be hinged together through an integral transverse hinge or they may be permanently pinned together in a manner known in the art.

20 This connector provides a means to securely attach a wiper blade to a wiper arm. It also allows for the aperture in the bridge of the blade to be kept to as small a size as possible in order that the support has an optimum strength and further provides for the simple and quick assembly of a windscreen wiper
25 system.

Referring now to Figure 4, a windscreen wiper arm 1101 is operatively connected at one end to the drive unit of a vehicle (not shown) and, at its other end, is provided with a U-shaped hook portion 1102. The relatively short leg
30 1103 of the hook portion 1102 is provided with an aperture 1104.

The connector 1110 comprises a body portion 1120 and a securing element 1130. The body portion 1120 has a pivot point 1121 about which it is connected to the blade of the assembly (not shown) and is further provided with side rails 1124 which provide support for the relatively long leg of the arm 1101.

The connector body 1120 is also provided with longitudinal arms 1126 and a transverse portion 1127 connecting the two arms 1127 defining a rectangular aperture 1128. The transverse portion 1127 is further provided with a longitudinal recess 1129.

The securing element 1130 is provided with a transverse portion 1131 of substantially circular cross-section, a spigot 1132 and an extension 1133. The extension 1133 is provided at a distal end thereof with a longitudinal projection 1134.

In order to assemble the windscreen wiper assembly, the body 1120 is pivotally connected about the pivot point 1121 to a wiper blade by a rivet or other manner known in the art. The transverse portion 1127 is wedged into a recess situated on the primary bridge 1000 of the wiper blade, thereby resiliently holding the connector in place. The transverse portion 1131 of the securing element 1130 is pivotally attached to the connector body 1120, in a snap-fit fashion, where it is held by transverse arms 1122 of the body 1120. When the longitudinal axes of the securing element 1130 and connector body 1120 are not parallel, the element 1130 is considered to lie in an open position.

The short leg 1103 of the hook 1102 is then placed through the rectangular aperture 1128 of the body and the body 1120 and hook 1103 are moved in opposite directions such that the main portion of the body 1120 is situated in the U-shaped portion of the hook 1102. The legs of the hook 1102 consequently straddle the main portion of the connector body 1120. The

securing element 1130 is then rotated about its pivot so that the extension 1133 is accommodated within the rectangular aperture 1128 of the body 1120. By forcing the securing element 1130 into its closed position (as shown in Figure 4) the spigot 1132 engages the aperture 1104 of the hook 1102 and the longitudinal projection 1134 of the extension 1133 engages the longitudinal recess 1129 of the transverse portion 1127 of the body 1120. The spigot 1132 also projects through the aperture 1104 of the hook 1102 and into an aperture 1136 on the connector body 1120 where it may engage a stop portion 1137. The projection of the spigot 1132 through the aperture 1104 of the hook 1102 and into the aperture 1136 of the body 1120 affords the connection greater strength.

Therefore, the securing element 1130 and connector body 1120 are resiliently connected by the snap-fit of projection 1134 with recess 1129 and the hook is resiliently held in place by the spigot 1132 engaging aperture 1104. The side rails 1124 of the connector body 1120 provide lateral support for the arm 1101.

In order to disassemble the assembly, a disengagement tab 1135 is pushed to force the securing element 1130 into its open position. The tab 1135 may be pushed through the aperture of the blade through which the hook 1101 was inserted.

When the securing element 1130 is forced into an open position the hook 1102 can, in conventional systems, impact on the primary bridge 1000 of the blade. This can obviously damage paint-work on both the bridge 1000 and the hook 1102 which can subsequently lead to further damage and can obviously be unsightly. In this embodiment, the transverse portion 1127 of the connector body 1120, which may be constructed from a plastics material as may be the other components, protects both the hook 1102 and bridge 1000 from such impacts.

Referring now to Figures 5 and 6, there is shown a further embodiment of windscreen wiper assembly with the arm 1101 and elements thereof given identical numerals to those in Figure 4.

5

The connector 2110 comprises a body 2120 and a securing element 2130, which are pivotally connected in the manner described with reference to Figure 4.

10 In this instance, however, the extension 2133 to the securing element 2130 is provided, on opposed sides thereof, with partially cut-out tabs 2135 which have outwardly projecting transverse projections 2136 situated thereon. The connector body 2120 is provided with longitudinal opposed arms 2126 connected by a transverse portion 2127. The arms 2126 are provided with
15 transverse recesses 2129 which may be through holes or blind holes.

 Once the hook 1102 of the arm 1101 is in place with its legs straddling the main part of the connector body 2120, the securing element 2130 is pivotally rotated into the closed position (Figure 6). This causes a spigot 2132
20 of the element to engage the aperture 1104 of the short leg 1103 of the hook 1102, thereby retaining it in place. The transverse projections 2136 engage the recesses 2129 in a snap-fit fashion, thereby retaining the securing element 2130, with respect to the body 2120, that is, in its closed position.

25 In order to disassemble the assembly, the tab 2134 on the extension 2133 of the securing element is pushed. This encourages the projections 2136 to disengage the recesses 2129 due to the inherent flexibility of the partially cut-out tabs 2135, and the spigot 2132 to disengage from the aperture 1104. The transverse portion 2127 again protects the hook 1102 and the bridge of the
30 blade from accidental damage through impact.

The connector bodies 1120, 2120 and securing elements 1130, 2130 may be constructed from a variety of materials such as plastics, aluminium or a number of light-weight alloys. The two components may be hinged together through an integral transverse hinge or they may be permanently pinned
5 together in a manner known in the art.

These further embodiments of connector provide further means to securely attach a wiper blade to a wiper arm. They further afford protection to the arm and blade upon assembly and disassembly from accidental damage
10 and allow a short hook portion to be used for ease of assembly and optimum strength.

CLAIMS

1. A connector for a windscreen wiper assembly, comprising a body with a
5 pivot point about which it is pivotally connectable to a windscreen wiper
blade and a securing element attached pivotably to the body for pivotal
movement between an open position and a closed position, wherein the
securing element further comprises restraining means arranged to engage
the end of the hook of the wiper arm, in use.
10
2. A connector according to claim 1, wherein the body is slideable between
the legs or side members of the hook of the wiper arm.
3. A connector according to claim 1 or 2, wherein said restraining means is
15 engageable with an aperture of the hook and, in use, in the closed position,
protrudes through the aperture.
4. A connector according to claim 1, 2 or 3, wherein said restraining means,
in the closed position, protrudes into a mating cavity of the connector
20 body.
5. A connector according to any preceding claim, wherein the securing
element is attached to the connector body in a snap-fit fashion.
- 25 6. A connector according to claim 5, wherein the snap-fit connection is
provided by a transverse projection on the securing element and transverse
restraining arms on the body.
7. A connector according to claim 6, wherein the transverse projection is of
30 substantially circular section and the transverse restraining arms define a
mating cavity of substantially circular section.

8. A connector according to any of claims 1 to 4, wherein the securing element is attached to the connector body, via an integral hinge portion.
- 5 9. A connector according to any preceding claim further comprising biasing means which, in use, in the closed position, biases a hook at an end of a wiper arm towards the body.
- 10 10. A connector according to claim 9, wherein said biasing means externally, and clampingly, engages, in use, the hook at the end of the wiper arm.
- 15 11. A connector according to claim 9 or 10, wherein said biasing means is further provided with a disengagement portion which provides a lever point to help with the manual forcing of the securing element towards its open position.
- 20 12. A connector according to any of claims 1 to 8, wherein the securing element is provided with a substantially perpendicular extension attached to a distal end thereof, such that, in use, in the closed position, the extension does not contact the hook of the wiper arm.
13. A connector according to claim 12, wherein the extension is accommodated within the confines of an aperture in the connector body.
- 25 14. A connector according to claim 12 or 13, wherein the securing element and connector body each comprise at least one mutually mating projections and/or respective recesses which, in the closed position, mate in a snap-fit fashion.
- 30 15. A connector according to claim 12, 13 or 14, wherein a pair of transverse projections are provided on the outside of longitudinal sides of the

extension which, in the closed position, mate with transverse recesses provided on inner longitudinal sides of the aperture of the connector body.

- 5 16. A connector according to claim 14 or 15, wherein a longitudinal projection is provided at a distal end of the extension which mates, in the closed position, with a recess provided in the inner distal end of the aperture in the connector body.
- 10 17. A connector according to any preceding claim, wherein the body is provided with longitudinal side rails which provide, in use, lateral support for edges of the wiper arm.
- 15 18. A connector according to any preceding claim, wherein the body is constructed from a plastics material.
- 20 19. A windscreen wiper assembly comprising a wiper arm, a wiper blade and a connector, the wiper arm being connectable to a drive unit, such as a pivot shaft, and having a hook at its distal end, the connector comprising a body with a pivot point about which it is pivotally connected to the wiper blade, and a pivotally attached securing element pivotable between an open position and a closed position, wherein the securing element further comprises restraining means engaged cooperatively with the hook of the distal wiper arm end.
- 25 20. An assembly according to claim 19, wherein the body is slideable between the legs or side members of the hook of the wiper arm.
- 30 21. An assembly according to claim 19 or 20, wherein said restraining means is engageable with an aperture of the hook and, in the closed position, protrudes through the aperture.

22. An assembly according to claim 19, 20 or 21, wherein said restraining means in the closed position protrudes into a mating cavity of the connector body.
- 5 23. An assembly according to any of claims 19 to 22, wherein the securing element is attached to the connector body in a snap-fit fashion.
24. An assembly according to claim 23, wherein the snap-fit connection is provided by a transverse projection on the securing element and transverse
10 restraining arms on the body.
25. An assembly according to claim 24, wherein the transverse projection is of substantially circular section and the transverse restraining arms define a mating cavity of substantially circular section.
- 15 26. An assembly according to any of claims 19 to 22, wherein the securing element is attached to the connector body, via an integral hinge portion.
27. An assembly according to any of claims 19 to 26 further comprising
20 biasing means which in the closed position, biases the hook at an end of a wiper arm towards the body.
28. An assembly according to claim 27, wherein said biasing means externally, and clampingly, engages the hook at the end of the wiper arm.
- 25 29. An assembly according to claim 27 or 28, wherein said biasing means is further provided with a disengagement portion which provides a lever point to help with the manual forcing of the securing element towards its open position.
- 30

30. An assembly according to any of claims 19 to 26, wherein the securing element is provided with a substantially perpendicular extension attached to a distal end thereof, such that in the closed position, the extension does not contact the hook of the wiper arm.

5

31. An assembly according to claim 30, wherein the extension is accommodated within the confines of an aperture in the connector body.

32. An assembly according to claim 30 or 31, wherein the securing element
10 and connector body each comprise at least one mutually mating projection and/or respective recess which, in the closed position, mate in a snap-fit fashion.

33. An assembly according to claim 30, 31 or 32, wherein a pair of transverse
15 projections are provided on the outside of longitudinal sides of the extension which, in the closed position, mate with transverse recesses provided on inner longitudinal sides of the aperture of the connector body.

34. An assembly according to claim 32 or 33, wherein a longitudinal
20 projection is provided at a distal end of the extension which mates, in the closed position, with a recess provided in the inner distal end of the aperture in the connector body.

35. An assembly according to any of claims 19 to 34, wherein the body is
25 provided with longitudinal side rails which provide lateral support for edges of the wiper arm.

36. A connector substantially as hereinbefore described with reference to Figures 2 and 3, Figure 4 or Figures 5 and 5A.

30

37. An assembly substantially as hereinbefore described with reference to Figures 2 and 3, Figure 4 or Figures 5 and 5A.



INVESTOR IN PEOPLE

Application No: GB 0002266.5
Claims searched: All

21.

Examiner: Richard Gregson
Date of search: 17 May 2000

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): A4F FAF

Int Cl (Ed.7): B60S (1/40, 42)

Other: Online: EPODOC, WPI, JAPIO.

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2332140 A (TRICO) - see diagrams in particular.	1,2,8,14, 19,20,26,32, at least.
Y	GB 2322069 A (TRICO) - see diagrams in particular	2,17 at least.
X	EP 0141186 A (EQUIP) - see diagrams in particular	1,8,14,18, 19,26,32.
Y	US 3725970 A (ALLARIA) - see diagrams in particular.	1,2,3,4,18, 19,21,22 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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